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Radulidium xigazense sp. nov., *Rhinocladiella tibetensis* sp. nov., and three new records of *Ramichloridium* from China

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Abstract — Two new species, *Radulidium xigazense* and *Rhinocladiella tibetensis,* are described and illustrated from the Qinghai-Tibet Plateau Area, China. *Ramichloridium apiculatum, R. brasilianum,* and *R. musae* represent new records for China. Specimens (dried cultures) and living cultures are deposited in the Herbarium of Shandong Agricultural University, Plant Pathology (HSAUP), and the Herbarium of Institute of Microbiology, Academia Sinica (HMAS).

Key words — dematiaceous hyphomycetes, soil fungi, taxonomy

Introduction

During a survey of soil dematiaceous hyphomycetes in China, we found two undescribed species and three new records. The species, all of which produce aseptate conidia on a sympodially proliferating rachis, are described and illustrated from cultures grown on malt extract agar (MEA) (Arzanlou et al. 2007).

Radulidium, established by Arzanlou et al. (2007), is characterized by conidiophores reduced to polyblastic conidiogenous cells that are widest at the base and have straight cylindrical to acicular rachis with crowded pale brown prominent blunt denticles and conidia that are solitary, 0-septate, subhyaline, smooth or verrucose, obovoidal to fusiform, base subtruncate and with a slightly prominent, conspicuously pigmented hilum. Seifert et al. (2011) cite two taxa for the genus.

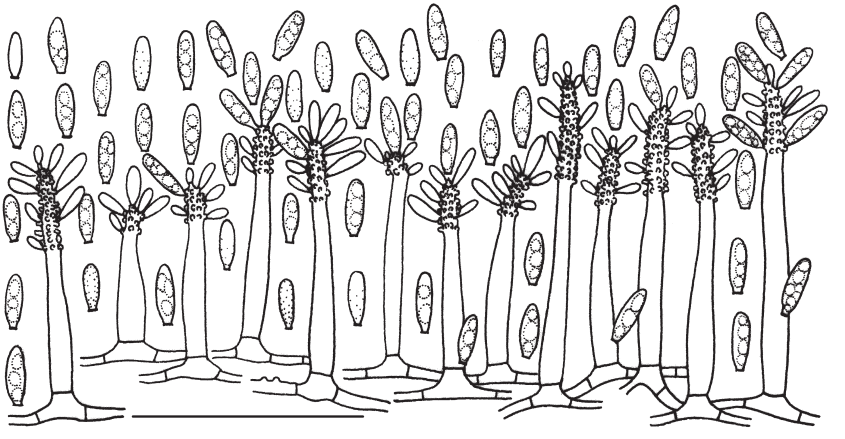

Fig. 1. *Radulidium xigazense* (ex holotype HSAUP II$_{07}$0964).
Conidia, conidiophores, and conidiogenous cells. Scale bar = 25 μm.

Radulidium xigazense Y.M. Wu & T.Y. Zhang, **sp. nov.** Fig. 1

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Differs from *Radulidium subulatum* by its conidia containing several oil droplets and from *R. epichloes* by its smaller conidia.

Type: China, Tibet: Xigaze, altitude 3900 m, from a forest soil, 18 Sept. 2007, Y.M. Wu (**Holotype** HSAUP II$_{07}$0964; **isotype** HMAS 196270).

Etymology: in reference to the type locality.

Colonies on MEA effuse, velvety, olivaceous brown. Mycelium mostly immersed, hyphae branched, septate, smooth, subhyaline, 1–2.5 μm wide. Conidiophores pale brown to subhyaline, mononematous, widest at the base and tapering towards the apex, cylindrical to acicular, generally straight rachis, with crowded, prominent, blunt denticles, smooth, 20–40 μm long, 2 –4 μm wide. Conidia solitary, subhyaline, smooth, 0-septate, clavate to fusiform, base subtruncate and with a slightly prominent hilum, containing several oil droplets, 5–7 × 1.5–2 μm.

Comments: Morphologically, *Radulidium xigazense* resembles *R. subulatum* (de Hoog) Arzanlou et al. and *R. epichloes* (Ellis & Dearn.) Arzanlou et al., but *R. epichloes* produces larger (5–11 × 2–3 μm) verruculose conidia, while *R. subulatum* conidia contain no oil droplets (Arzanlou et al. 2007).

Rhinocladiella, established by Nannfeldt (Melin & Nannfeldt 1934), is characterized by conidiophores that are usually branched, brown, and paler towards the apex, intercalary or terminal conidiogenous cells that are cylindrical to acicular, subdenticulate rachis, non-pigmented, and conidia that are solitary,

0-septate, hyaline to subhyaline, smooth, and subglobose to ovoid or long-ellipsoid. Seifert et al. (2011) lists 11 taxa for the genus.

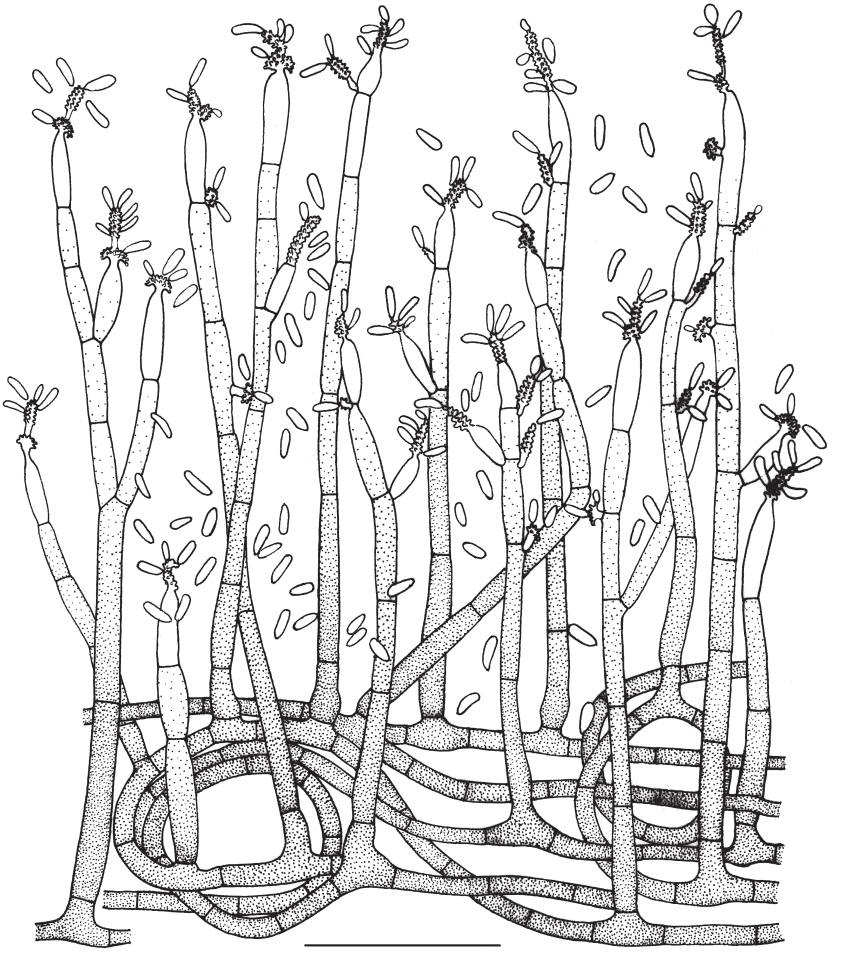

Fig. 2. *Rhinocladiella tibetensis* (ex holotype HSAUP II$_{07}$0991). Conidia, conidiophores, and conidiogenous cells. Scale bar = 25 μm.

Rhinocladiella tibetensis Y.M. Wu & T.Y. Zhang, **sp. nov.** Fig. 2

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Differs from the *Rhinocladiella* state of *Dictyotrichiella mansonii* by its slightly curved conidia and longer conidiophores, and from *R. pedrosoi* by its narrower and slightly curved conidia.

Type: China, Tibet: Jiangzi, altitude 4000 m, from an everglade soil, 10 Sept. 2007, Y.M. Wu (**Holotype** HSAUP II$_{07}$0991; **isotype** HMAS 196271).

Etymology: in reference to the type locality.

Colonies on MEA effuse, felted, olivaceous to blackish brown. Mycelium superficial or immersed, hyphae branched, septate, smooth, pale brown, 2–3 µm wide. Conidiophores brown, paler towards the apex, macronematous, mononematous, solitary or in groups, erect, septate, smooth, 50–140 µm long and 3–4 µm wide. Conidiogenous cells hyaline, terminal or intercalary, 5–25 µm long and 2–4 µm wide, slightly wider at the middle than the basal part. Conidia hyaline, smooth, 0-septate, clavate, slightly curved, 3–5 × 1–2 µm.

Comments: Morphologically, *Rhinocladiella tibetensis* resembles the *Rhinocladiella* state of *Dictyotrichiella mansonii* Schol-Schwarz and *R. pedrosoi* (Brumpt) Schol-Schwarz, but *D. mansonii* has longer conidiophores and uncurved conidia, and *R. pedrosoi* has wider (3–5 × 2–3 µm) uncurved conidia (Schol-Schwarz 1968).

Ramichloridium, validated by de Hoog (1977), is characterized by straight unbranched brown conidiophores, conidiogenous cells that are integrated, terminal, polyblastic, smooth, golden-brown, subhyaline to pale brown, straight or flexuose, with conspicuous conidiogenous loci or slightly prominent denticles, and conidia that are solitary, 0–1-septate, subhyaline to pale brown, smooth to coarsely verrucose, obovate, obconical to fusiform, and with a prominent hilum. Seifert et al. (2011) lists 21 taxa for the genus.

Ramichloridium apiculatum (J.H. Mill., Giddens & A.A. Foster) de Hoog, Stud. Mycol. 15: 69. 1977. Fig. 3

Colonies on MEA effuse, velvety, olivaceous green. Mycelium superficial or immersed, hyphae branched, septate, smooth, pale to mid brown, 2–3 µm wide. Conidiophores straight, unbranched, smooth or slightly rough, dark brown, up to 100 µm long. Conidiogenous cells integrated, terminal, golden-brown, straight, cylindrical, with conspicuous conidiogenous loci, 25–40 × 2–3.5 µm. Conidia solitary, pale brown, finely verrucose, 0-septate, obovate to obconical, 5–7 × 3–4 µm, hilum conspicuous.

Specimen examined: **CHINA. Tibet**: Xigaze, altitude 3900 m, from a forest soil, 9 Sept. 2007, Y.M. Wu (HSAUP II$_{07}$1427, HMAS 196272).

Ramichloridium apiculatum is reported for the first time from China. Our specimens share the obovate to obconical 0-septate finely verrucose pale brown conidia with a conspicuous hilum and that measure 5–7 × 3–4 µm as described by de Hoog (1977). The species is most similar in conidial shape to *R. cerophilum* (Tubaki) de Hoog, which differs in its smooth conidia with 1–3 short secondary conidia (de Hoog 1977).

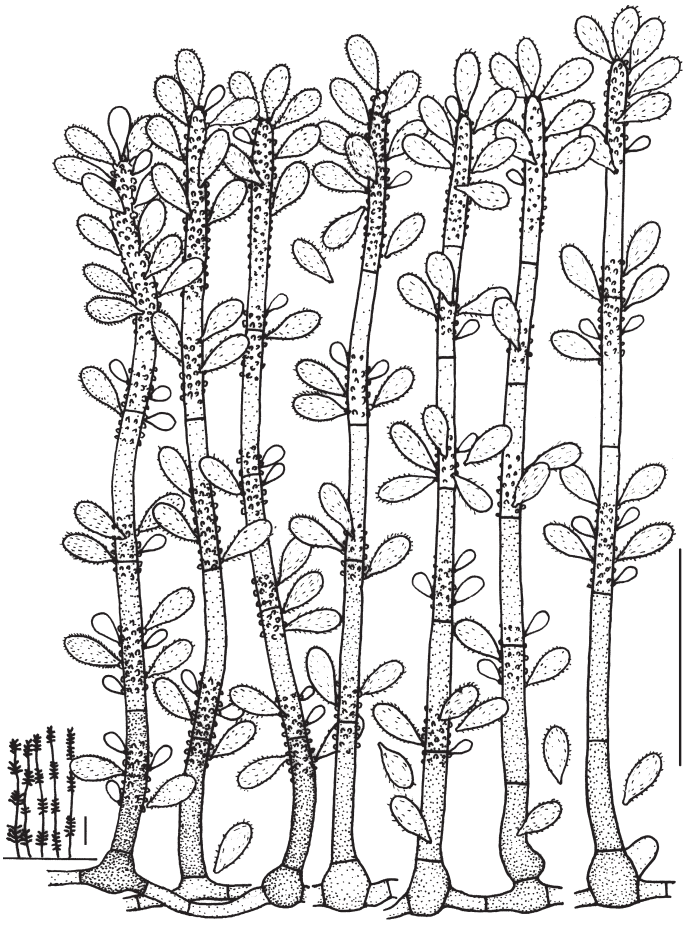

Fig. 3. *Ramichloridium apiculatum* (HSAUP II $_{07}$1427).
Conidia, conidiophores, and conidiogenous cells. Scale bars = 25 *μ*m.

Ramichloridium brasilianum Arzanlou & Crous, Stud. Mycol. 58: 72. 2007. Fig. 4

Colonies on MEA effuse, velvety to hairy, dark olivaceous-grey. Mycelium superficial or immersed, hyphae branched, septate, smooth or slightly rough, olivaceous-brown, 1.5–2 μm wide. Conidiophores straight, unbranched, smooth or slightly rough, dark brown, up to 70 μm long. Conidiogenous cells integrated, terminal, subhyaline, straight, cylindrical, with conspicuous conidiogenous loci, 15–30 × 2–3.5 μm. Conidia solitary, pale brown, finely verrucose, 0-septate, obovoid to fusiform, 4–6 × 2–2.5 μm, hilum conspicuous.

Specimen examined: **China. Tibet**: Nagri, altitude 4700 m, from a mountain soil, 18 Sept. 2007, Y.M. Wu (HSAUP II $_{07}$1388, HMAS 196273).

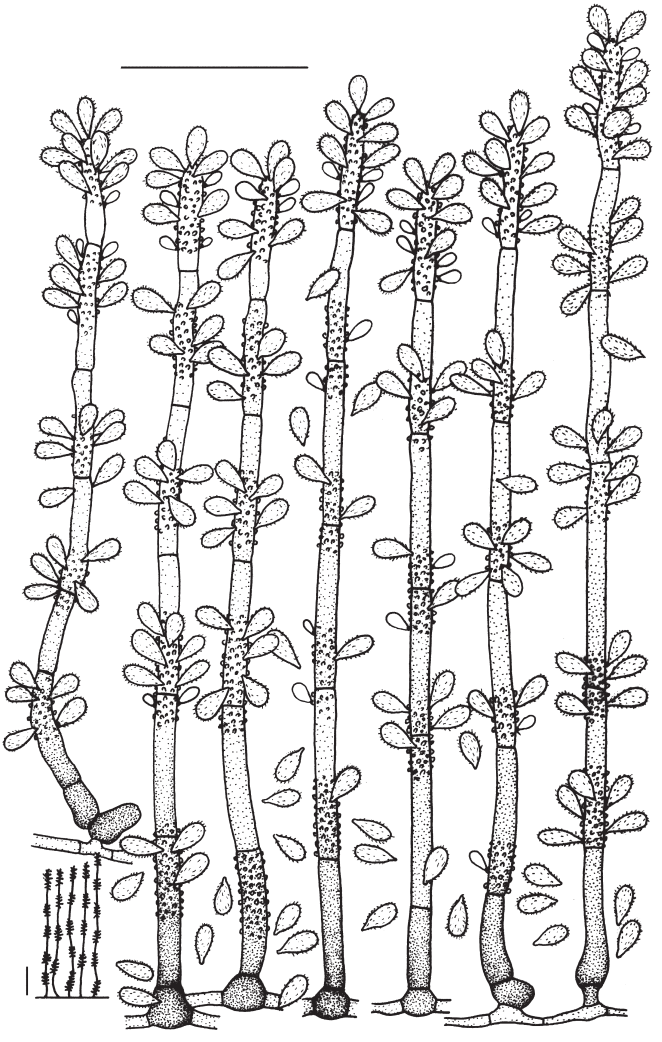

Fig. 4. *Ramichloridium brasilianum* (HSAUP II $_{07}$1388).
Conidia, conidiophores, and conidiogenous cells. Scale bars = 25 μm.

Ramichloridium brasilianum is also reported for the first time from China. Our specimens share the pale brown conidia that are obovoid to fusiform, finely verrucose, 0-septate, hilum conspicuous, and measure 4–6 × 2–2.5 μm as described by Arzanlou et al. (2007). The species is most similar in conidial shape to *R. biverticillatum* Arzanlou & Crous, which differs in its smooth and smaller (3–4 × 1.5–2.5 μm) conidia (Arzanlou et al. 2007).

Ramichloridium musae (Stahel ex M.B. Ellis) de Hoog, Stud. Mycol. 15: 62. 1977. Fig. 5

Colonies on MEA effuse, velvety to hairy, olivaceous-grey. Mycelium superficial or immersed, hyphae branched, septate, smooth, olivaceous- brown, 1–2 µm wide. Conidiophores straight, unbranched, smooth or slightly rough, brown, up to 160 µm long. Conidiogenous cells integrated, terminal, subhyaline, straight, cylindrical, with conspicuous conidiogenous loci, 20–30 ×

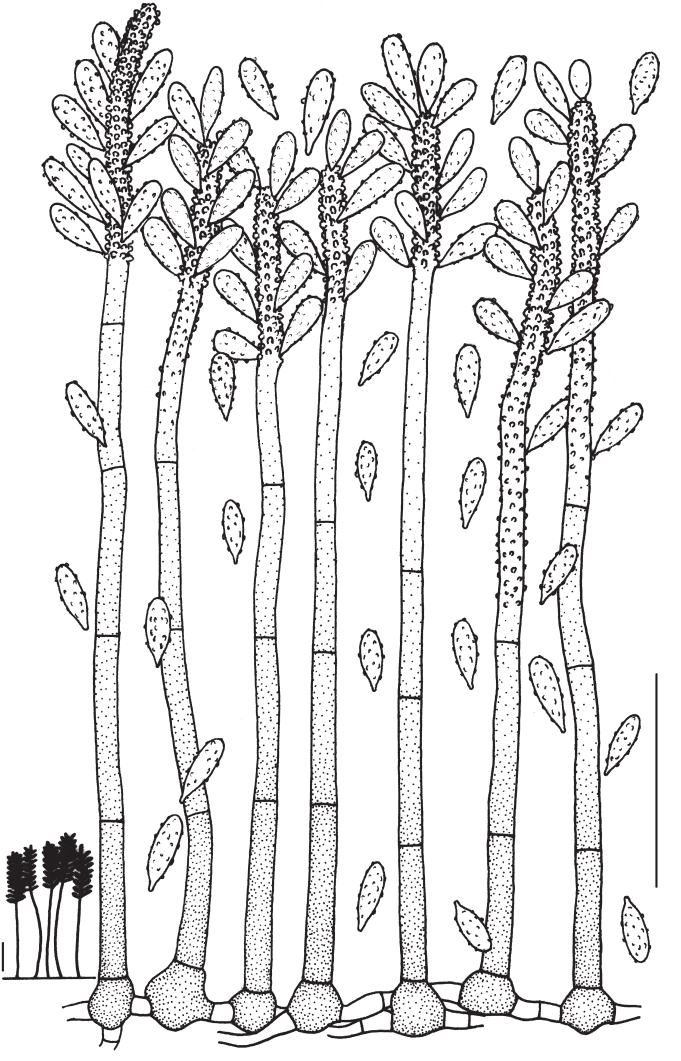

Fig. 5. *Ramichloridium musae* (HSAUP II $_{07}$0576).
Conidia, conidiophores, and conidiogenous cells. Scale bars = 25 μm.

2–2.5 µm. Conidia solitary, pale brown, finely verrucose, 0-septate, obovate to obconical, 7–9 × 2–3 µm, hilum conspicuous.

Specimen examined: **CHINA. Tibet**: Shannan, altitude 3500 m, from a grassland soil, 10 Jun. 2007, Y.M. Wu (HSAUP II $_{07}$0576, HMAS 196274).

Ramichloridium musae is reported for the first time from China. Our specimens share the pale brown conidia that are obovate to obconical, finely verrucose, 0-septate, hilum conspicuous, and measure 7–9 × 2–3 µm as described by de Hoog (1977). The species is most similar in conidial shape to *R. cerophilum*, which is distinguished by smooth and smaller conidia (6–7 × 2–3 µm; de Hoog 1977).

Acknowledgments

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